

Claims

We Claim:

1. A method of preparing a shaped dental prosthetic device for use in a human mouth comprising:
  - dispensing a mixture of first monomers and second monomers, each first monomer having at least one thiol functional group and each second monomer having at least one vinyl functional group, wherein 10% to 90% of the functional groups in the mixture are thiol functional groups;
  - shaping the mixture into the form of the shaped dental prosthetic device; and
  - photopolymerizing the shaped mixture.
2. The method of claim 1, wherein the mixture includes an initiator that initiates polymerization of the mixture upon exposure to light from an associated light source and photopolymerizing comprises:
  - exposing the shaped mixture to an effective amount of light from the associated source to initiate polymerization.
3. The method of claim 2, wherein the initiator is camphorquinone.
4. The method of claim 3, wherein the associated light source is a visible light source.
5. The method of claim 2, wherein the initiator is 2,2-dimethoxy-2-phenylacetophenone and the associated light source is an ultraviolet light source.
6. The method of claim 1, wherein each first monomer has at least two thiol functional groups.
7. The method of claim 1, wherein 25% to 60% of the functional groups in the mixture are thiol functional groups.
8. The method of claim 7, wherein 45% to 55% of the functional groups in the mixture are thiol functional groups.

9. The method of claim 8, wherein about 50% of the functional groups in the mixture are thiol functional groups.
10. The method of claim 2, wherein the exposing is performed only once in a single exposing step.
11. The method of claim 6, wherein each first monomer is an oligomer of monomers having thiol functional groups.
12. The method of claim 1, wherein each second monomer is an oligomer of monomers having vinyl functional groups.
13. A dental prosthetic device comprising:  
a polymer created from the polymerization of a mixture of first monomers having thiol functional groups and second monomers having vinyl functional groups; wherein at least about 10% the functional groups of the polymer are thiol functional groups.
14. The dental prosthetic device of claim 13, wherein the mixture further comprises an initiator.
15. The dental prosthetic device of claim 13, wherein at least about 25% of the functional groups of the mixture are thiol functional groups.
16. The dental prosthetic device of claim 13, wherein at least about 45% of the functional groups of the mixture are thiol functional groups.
17. The dental prosthetic device of claim 13, wherein at least about 50% of the functional groups of the mixture are thiol functional groups.
18. The dental prosthetic device of claim 13 further comprising:  
particles of filler within the polymer.

19. The dental prosthetic device of claim 13, wherein the mixture was shaped into the dental prosthetic device and then photopolymerized until at least about an 85% conversion of the thiol functional groups of the mixture is achieved.
20. The dental prosthetic device of claim 13 having a volume shrinkage of less than 10% after polymerization.
21. The dental prosthetic device of claim 13 having a shrinkage stress of less than 0.5 MPa.
22. The dental prosthetic device of claim 13 having a shrinkage stress of less than 1.5 MPa.
23. A photopolymerizable dental restorative material comprising:
  - particles of filler;
  - first monomers having thiol functional groups;
  - second monomers having vinyl functional groups; and
  - an initiator;wherein at least about 10% of the functional groups in the dental restorative material are thiol functional groups.
24. The photopolymerizable dental restorative material of claim 23, wherein at least about 25% of the functional groups in the dental restorative material are thiol functional groups.
25. The photopolymerizable dental restorative material of claim 23, wherein at least about 45% of the functional groups in the dental restorative material are thiol functional groups.
26. The photopolymerizable dental restorative material of claim 23, wherein at least about 50% of the functional groups in the dental restorative material are thiol functional groups.

27. The photopolymerizable dental restorative material of claim 23, wherein at least about 60% of the functional groups in the dental restorative material are thiol functional groups.
28. The photopolymerizable dental restorative material of claim 23 that when polymerized obtains a thiol functional group conversion of greater than 85%.
29. The photopolymerizable dental restorative material of claim 23 that when polymerized exhibits a volume shrinkage of less than 10%.
30. The photopolymerizable dental restorative material of claim 23 that when polymerized creates a polymer having an average weight loss, when dried, of 0.4 to 0.6% relative to an original mass before extraction.
31. A dispensing device comprising an unpolymerized quantity of the photopolymerizable dental restorative material of claim 23.
32. The photopolymerizable dental restorative material of claim 23 that when polymerized creates a polymer having a shrinkage stress of less than 3.0 MPa.
33. The photopolymerizable dental restorative material of claim 23 that when polymerized creates a polymer having a shrinkage stress of less than 1.5 MPa.
34. The photopolymerizable dental restorative material of claim 23 that when polymerized creates a polymer having a shrinkage stress of less than 0.5 MPa.
35. A photopolymerizable mixture comprising:
  - first monomers having thiol functional groups;
  - second monomers having functional groups; and
  - an initiator;

wherein at least about 10% of the functional groups in the photopolymerizable mixture are thiol functional groups.

36. The photopolymerizable mixture of claim 35, wherein the functional groups of the second monomer consist of vinyl functional groups.
37. The photopolymerizable mixture of claim 35 having a thiol functional group conversion of greater than 85% upon polymerization.
38. The photopolymerizable mixture of claim C2 having a vinyl functional group conversion of greater than 85% upon polymerization.
39. The photopolymerizable mixture of claim 35 having a glass transition temperature of greater than 60 degrees Celsius.
40. The photopolymerizable mixture of claim 35 having a volume shrinkage of less than 10% after polymerization.
41. The photopolymerizable mixture of claim 35 having a volume shrinkage of less than 5% after polymerization.
42. The photopolymerizable mixture of claim 35 having a volume shrinkage of less than 3% after polymerization.
43. The photopolymerizable mixture of claim 35 having a volume shrinkage of less than 10%, a glass transition temperature greater than 60 degrees Celsius and a flexural strength of greater than 65 Mega Pascals after polymerization.